ADDENDUM 4 TO APPENDIX 2 TO SCHEDULE 3.3 TO THE COMPREHENSIVE INFRASTRUCTURE AGREEMENT

STATEMENT OF TECHNICAL APPROACH

Statement of Technology Approach for Internal Application Services

Northrop Grumman will perform all services from locations within the geographic boundaries of the Commonwealth.

Northrop Grumman will deliver CMMI Level 3 processes and procedures on the Service Commencement Date. Its organization will develop, document, validate and deploy solutions. Northrop Grumman is also responsible for configuration management for the product lifecycle including documentation services. In parallel, Northrop Grumman will develop a training and knowledge transfer plan for the organization.

Northrop Grumman will provide a 90-day warranty for Vendor-developed applications that have been placed into production. During this period, Northrop Grumman will fix defects at no charge to the Commonwealth.

Northrop Grumman will perform complete lifecycle applications maintenance. This includes corrective, preventive, adaptive, and performance maintenance, release packaging and technical and end-user support. Monitoring, reporting and reviews will be used to identify potential performance and services issues.

Approach for Internal Applications

Northrop Grumman will recruit, hire and transition the VITA employees currently supporting the internal applications. Those employees who choose to transition will be trained in Northrop Grumman's CMMI processes and procedures and cross-trained in other technical areas.

Vendor facilities—Northrop Grumman will use the existing Applications Development components from the current VITA facility(s) in its Applications Development environment.

Applications Services—Northrop Grumman will provide lifecycle services for internal applications using its existing CMMI Level 3-compliant processes, procedures and templates. This process suite will address maintenance support of systems in production, new development, enhancements, and COTS integration for the full range of project sizes from the very small to the very large.

Exhibit 1 illustrates the system lifecycle as it maps to the development model. Included are deliverables, technical and quality assurance reviews, quality "touch points," and configuration management baselines.

[Proprietary information redacted by the Commonwealth at the request of Northrop Grumman]

Exhibit 1 System Lifecycle

Each project deliverable will undergo a peer review. Any defects identified during the review will be corrected prior to submission to the Commonwealth. Defects uncovered at these peer reviews will be documented and used as part of the continual process improvement effort. When documents are ready for submission, Northrop Grumman will conduct a technical review with representatives from the Commonwealth to formally review and approve the document. A go/no-go decision from the review becomes the basis for moving forward to the next project phase.

Requirements Engineering—The requirements engineering process is used to identify, analyze, specify, define, prioritize, derive, partition, allocate, track, manage, verify, and validate the system requirements. The Commonwealth will develop and document the Business Requirements and will continue to be involved in all aspects of the development lifecycle. This includes approving any future changes to the requirements, as well as attending and approving design, test and production reviews.

Exhibit 2 is a high-level presentation of the requirements engineering process.

Northrop Grumman will take the requirements that are allocated to software and translate them into software requirements or specifications. If necessary, Northrop Grumman will then document any system constraints relating to areas such as architecture, security, and software and hardware standards that may constrain the design. The Systems Architecture Document (SAD) then documents the functional requirements, which map back to the business requirements. The SAD also documents logical and physical data models. Product and product component requirements are then derived from the selected design solution and traced back to the business requirements. They are initially identified in the SAD and further refined in the System Design Document (SDD).

For small projects (under 20 man-days), links between the business requirements and product/product components will be maintained in spreadsheet tables. These tables will be included in the systems documentation.

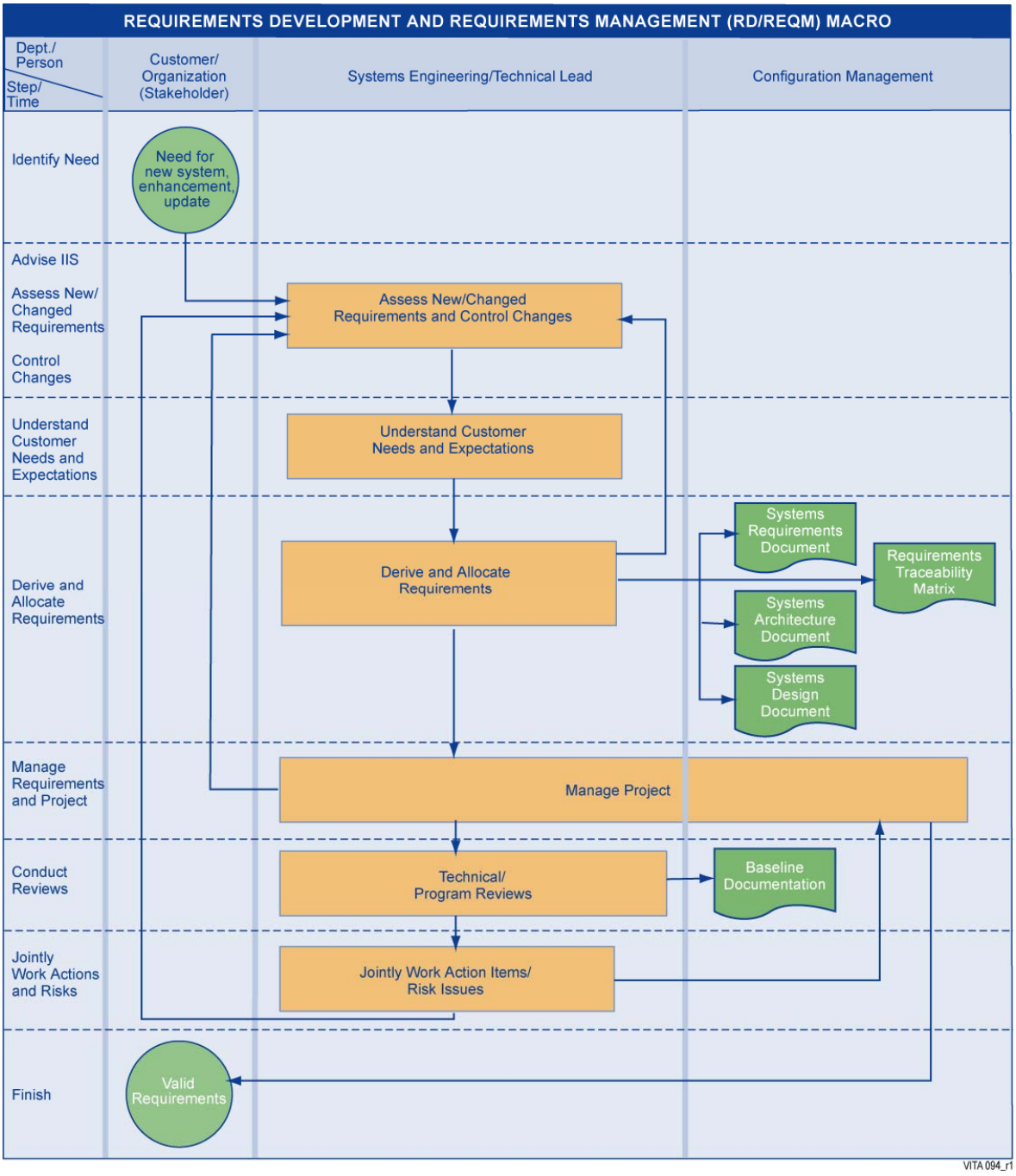

Exhibit 2 Requirements Engineering Process

Technical Approach—The technical approach process guides definition, design, and implementation through a series of steps to decompose the components to the lowest-level configuration items (CIs), whether built or procured, and implementation of these CIs through integration into a complete system.

During the design process, factors such as extensibility, maintainability, scalability, robustness, and reliability are addressed. Decision analysis and resolution techniques are used to decide between make/buy alternatives and design alternatives. An SDD is developed to document the

design. Development activity work instructions that complement the technical approach process offer specific detail on how to design applications as well as databases.

The development piece of the process covers the alternatives of in-house custom development, customization of COTS products or implementation of COTS packages. In-house development includes unit testing of developed components.

The technical approach also addresses integration of individual components into subsystems and systems and associated testing at those levels, as well as installation of the system into a production environment. Integration testing confirms that the individual program components work together properly and perform their specified functions. This testing includes application interfaces. The testing steps of the TS process are further elaborated in separate verification and validation process descriptions.

In accordance with Northrop Grumman's process, the maintenance support of post production applications are handled by separate, recurring maintenance umbrella projects.

For application systems already in production, Northrop Grumman will transition to this maintenance umbrella project approach. Northrop Grumman will establish teams and write project plans defining that common approach. There will then be a planned transition of the portfolio of existing applications systems to that approach. Once a system is transitioned and has its maintenance umbrella project in place, Northrop Grumman will track defects and be measured against the other performance goals within the Service Level Agreements.

Exhibit 3 is a high-level presentation of the technical approach process.

[Proprietary information redacted by the Commonwealth at the request of Northrop Grumman]

Exhibit-3 Technical Approach Process

Verification/Validation-Verify system (VER) and validate system (VAL) activities both involve testing, but address different issues. Validation confirms that the system, as built (or as it will be built), will satisfy the user's needs; verification addresses whether the system, its elements, interfaces (environment connectivity), and incremental work products satisfy their requirements. Verification determines conformance to these requirements, and validation determines that the requirements and the system implementation provide the right or optimum solution to the customer's problem.

Exhibit 4 and **Exhibit 5** are high-level presentations of the verification and validation processes.

[Proprietary information redacted by the Commonwealth at the request of Northrop Grumman]

Exhibit 4 Verification Process

[Proprietary information redacted by the Commonwealth at the request of Northrop Grumman]

Exhibit 5 Validation Process

Configuration Management: Northrop Grumman will develop a comprehensive Configuration Management Plan for the program. This plan will document how Northrop Grumman will establish and maintain the integrity of the work products (referred to as CIs), through the performance of four primary Configuration Management (CM) functions:

- Configuration Identification
  - Identify items to be placed under CM
  - Assign unique naming/numbering conventions to identify CIs
- Configuration Tracking and Control
  - Establish baselines
  - Version control
  - Manage changes
- Configuration Status Accounting
  - Reporting
  - Lifecycle reviews
- Configuration Audits
  - Internal and External

Northrop Grumman will assign a configuration manager to perform the CM activities, who will be trained in the CMMI CM support process area; Northrop Grumman's specific CM processes and procedures, as well as the supporting toolsets. The configuration manager will be an active member of the Change Control Boards (CCBs) and represent CM at lifecycle reviews. To assure Sarbanes-Oxley (SOX) compliance regarding separation of duty, the configuration manager role will not be performed by a member of the development team.

CIs include both COTS and in-house developed work products. CIs to be placed under CM include:

- Infrastructure and application software
  - Includes licenses and license keys
- Hardware
- Documentation
- Media

Northrop Grumman will establish a CM system. The system will include toolsets, repositories, processes, and trained resources. The toolsets and repositories will be accessible, secured and backed up. The system will provide for version control, history and other CI attributes. Northrop Grumman will utilize a variety of toolsets to support CM including ClearCase for distributed

software applications and Livelink for documentation. A physical CM library will be used to track and control in-house and COTS media such as tapes, CDs and diskettes; and hard copy documentation such as user manuals and installation and test procedures. The CM Library will be secured. The CIs maintained in the CM Library will be accessible for check in/out and backed up. Copyright laws provide for duplication of documentation and media for backup and recovery purposes.

To review and disposition VITA and non-VITA changes during all phases of the lifecycle, Northrop Grumman will establish CCBs, comprised of its customer and other relevant stakeholders. The CCBs will efficiently communicate and coordinate all changes. Change Requests (CRs) will be processed based on priority and risk. There will be a process for handling emergency changes.

Northrop Grumman will utilize the Peregrine systems suite for problem/ incident management and root cause analysis in addition to change management.

The configuration and change managers will track and control changes so that approved changes are made to the CM authority version of the CI, the change has been tested, and the supporting documentation is updated and under CM. The configuration and change managers work closely with the integrator so that the CM authority version is deployed into the environment. They also work with the test team to track and control defects through all phases of the lifecycle. Developmental, test and production discrepancy reports will be associated to change records.

Note that changes to server, network and other configurations are subject to other Northrop Grumman design reviews as a front-end to the change management.

Northrop Grumman will assist in the integration of non-VITA applications into the VITA network. After Northrop Grumman facilitates an impact analysis of each application, the application will be introduced into the staging/ test environment where acceptance testing and regression testing will be performed. Any issues or defects identified will be addressed with the supplier of the application, in accordance with acceptance criteria previously defined and to which all parties agreed. Once accepted, the application will be handled using the standard CM process and elevated to the production environment in a formal manner.

Measurement and Analysis (M&A)—M&A activities generate information that is vital in quantitatively assessing a project's health.

Training and knowledge transfer—Prior to Northrop Grumman rolling out a complete set of revised processes, the full team will require training. Based on the plan Northrop Grumman used to train its organization, a training plan will be developed to address how employees will be trained and knowledge transferred to VITA support personnel. Once the processes are in place, support personnel will require training. Depending on the location, Northrop Grumman will use either classroom training, or online training using NetMeeting and existing training materials.

Application warranty services—Northrop Grumman will make every attempt to remove all defects prior to applications being placed into the production environment. Any defects identified within the 90-day warranty period will be repaired at no charge to the Commonwealth.

Application maintenance services—Northrop Grumman will document the repair policies and procedures in the application maintenance plan. This plan will include how Northrop Grumman

will provide adaptive, corrective, preventive, and performance maintenance as well as support the VITA IT Application Development Group, release packaging and the help desk.

Monitoring reporting and review services—Northrop Grumman will provide the required monitoring, reporting and review services, including Level 2 and Level 3 support associated with the help desk. Northrop Grumman will create an improvement plan to address services that do not meet current service levels, and reports to address responses times and productivity in accordance with the terms of the Agreement.

Cross Functional Processes

Northrop Grumman's Internal Applications team will work closely with its Cross Functional Services Office to provide common processes, procedures and policies are implemented and fully documented across all teams. Northrop Grumman will implement CMMI Level 3 processes and procedures beginning on the Service Commencement Date.

Schedule for Internal Applications Services

Following contract award employees will take approximately 15 hours of courses. The anticipation is that this training period will take no more than 2 months to complete. During this time, Northrop Grumman will make an assessment along with recommendations for both the existing internal and external applications.